ILLUSTRATION 5-3

Procedures for Engineers Assisting a Cargo Tank Manufacturer Review

Background: The Federal Motor Carrier Safety Administration (FMCSA) is delegated the authority for reviewing those entities engaged in the manufacture of specification cargo tanks. Part of this review involves the evaluation of cargo tank designs to determine compliance with the specifications which are set forth in Part 178 of the Hazardous Materials Regulations (HMR). This evaluation requires extensive knowledge of engineering mechanics and methods of stress analysis in metal structures. FMCSA has requested and received assistance from the FHWA Office of Engineering in conducting the engineering analysis portion of the cargo tank manufacturer reviews. This document outlines the role of the FHWA structural engineer prior to the review, during the on-site review of the facility, in reviewing manufacturer's documents, in conducting independent structural analysis, in reporting findings, and in reviewing analysis done by engineers.

Pre-Review Responsibilities

1. Meet with the FMCSA investigator to review any information available on the cargo tank manufacturer (CTM). This information may include, but is not limited to: prior reviews, prior enforcement, operational data (including types of tanks manufactured), and complaint information.

2. Plan the strategy for the on-site visit with the FMCSA investigator.

3. In conjunction with the FMCSA investigator, review the list of information (from the "Guidelines for Structural Analysis of Cargo Tanks") to be gathered during the review and, unless an unannounced visit is planned, transmit that list to the CTM prior to the on-site visit. It may be possible to gather some information before the on-site review.

4. If possible, in conjunction with the FMCSA investigator decide what cargo tank design(s) will be evaluated.

5. Review the "Guidelines for Structural Evaluation of Cargo Tanks." (Guidelines)

6. Review the Hazardous Materials Regulations (HMR) specifications in 49 C.F.R. Part 178 for the specific cargo tanks to be evaluated.

On-Site Review Responsibilities

1. Gather all information necessary to complete an independent structural analysis of the chosen cargo tank design(s) (see "Information Collection for Structural Analysis" sheet - Illustration 5-4 from the Guidelines (also attached)).

2. Verify that the sketches, drawings, and calculations used for certification of the design are present, accurate, and complete.

3. If possible, verify that the cargo tanks are being built to the certified design by comparing the design to a finished or partially finished tank.

4. Assist the FMCSA investigator in review of the quality control program and fabrication methods if necessary.

Conducting Structural Analysis of Cargo Tank Designs

1. All review of cargo tank designs will be done using the "Guidelines for Structural Evaluation of Cargo Tanks" (Guidelines). In addition, the ASME Code will be necessary when performing these reviews.

2. Review of the CTM calculations will be conducted to identify analysis methods used. If the analysis methods used were based on incorrect engineering assumptions or incorrect interpretations of the regulations, they should be noted.

3. **Independent analyses of each cargo tank design will be done using the Guidelines and the ASME Code.** This analysis will be performed on the structural integrity of the tank, the overturn protection, the rear-end protection, the bottom damage protection, and the adequacy of ring-stiffeners when applicable. Independent analysis may not be necessary if the CTM calculations are complete, understandable, and based on valid engineering assumptions.

4. The review of the CTM calculations and the independent structural analyses will be compiled in a report outlining the fitness of each cargo tank design. The

report should include detailed calculations, appropriate drawings, a listing of assumptions made during analysis, documentation of the design details on which the analysis was based (blueprints, data plate information, U1-A forms, etc.), and conclusions about the compliance of each design with the specifications.

Verification of Structural Analysis

A verification of the structural analysis will be performed by a second, experienced, engineer if:

1. The engineer performing the analysis is new to the program, or
2. The initial analysis resulted in the discovery of structural violations for which enforcement is being considered.

The purpose of this verification is to:

1. Verify that the engineer conducting the analysis is correctly interpreting the Guidelines, the ASME Code, and the HMR, and
2. Verify that calculations are correct.

The verifying engineer will produce a report which:

1. Confirms the results of the analysis,
2. Confirms the results of the analysis with comments, or
3. Outlines the area in which the analysis is deficient.

In addition to confirmation of the analysis, the engineer should include any comments necessary to assist the other engineer during future reviews.